The Direct Broadcast User Perspective

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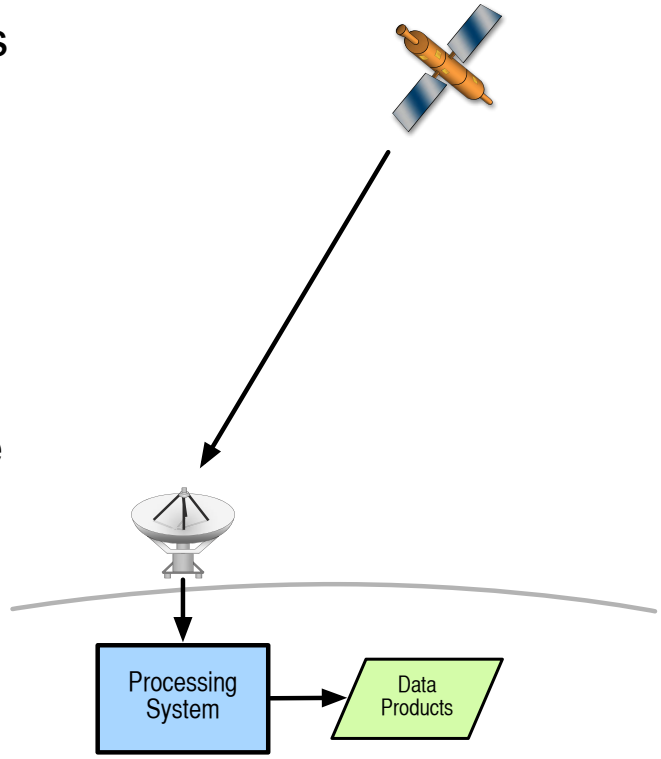
Direct Broadcast

- Direct Broadcast allows users to generate products locally from data received directly from satellites
- Products are generated with low latency, data coverage is specific to the users' local region
- Data is used in real-time decision making
- US missions with a direct broadcast stream: Aqua, Terra, Suomi NPP, GOES 13, 14, 15 and 16
- DB has opened up data access to a wide audience of users and apps, especially for realtime decision making, that wouldn't have happened otherwise
- DB is generally a robust and reliable method of distribution
- Some users can get data via terrestrial distribution: but some do not have access to a reliable internet connection with sufficient bandwidth



CSPP Users

CSPP registration database on 2017-01-19 comprises 1537 registrants in 84 countries

1 user
2 to 9 users
10 or more users

Direct Broadcast Software

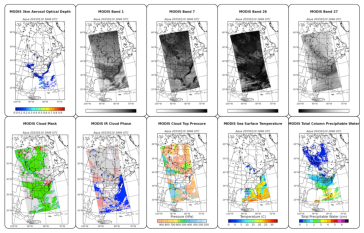
- Users have come to expect that they can receive data using stations that they have built or bought, and there will be freely available software
- Availability of free software lowers cost for end users
- Allows vendors to focus on hardware, lower total cost of ownership
- Often software has already been developed by the government
- Allows people to start working with the data sooner
- Software is freely available to process data from U.S. weather satellites through:
  - IMAPP
  - CSPP LEO
  - CSPP Geo
- The software supports the creation of calibrated observational data, geophysical derived products, and mapped images from visible, infrared, and microwave sensors.

International MODIS/AIRS Processing Package (IMAPP)

- Supported missions: Aqua and Terra, also Suomi NPP and JPSS-1
- Funded by NASA since 2000

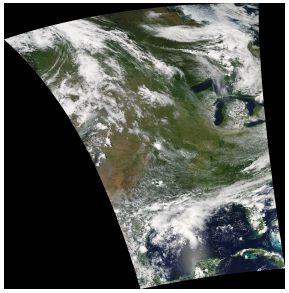
Product Software

IMAPP MODIS Level 2 Products

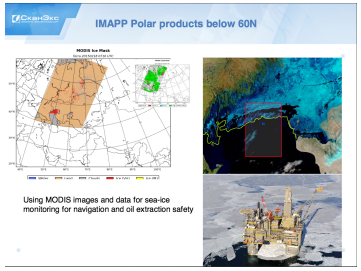


- Atmosphere Group Collect 6 – MODIS Science Team Software
- MODIS Polar Products
- MODIS Land Products (Terra and Aqua)
- AIRS and AMSU Products (Aqua)
- AMSR-E Products
- HYDRA2 Multispectral Data Analysis Toolkit
- Numerical Weather Prediction (NWP) Model DBCRAS
- Overshooting Tops Aviation Hazard Software
- Visibility Products – Aviation Applications
- IMAPP Virtual Appliance
- Infusing satellite Data into Environmental Applications – International (IDEA-I)
- Web Mapping Service (WMS) for display of GeoTIFFs
- MODIS Image Products

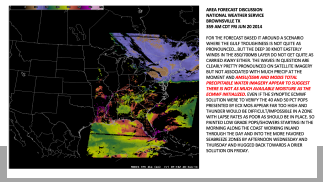
Polar2Grid True Color MODIS



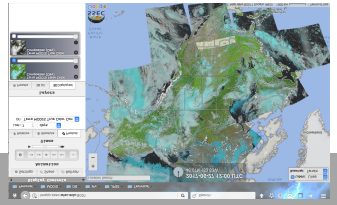
MODIS Polar Products



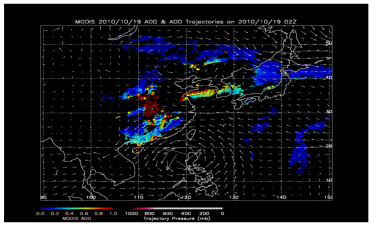
AWIPS Forecasting POPs



IMAPP Web Mapping Service



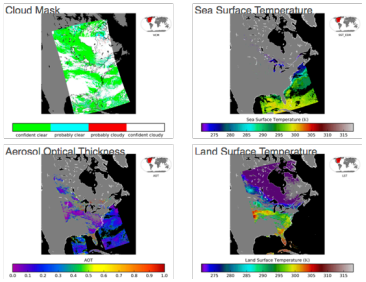
IDEA-I Trajectory 48 hour forecast



Community Satellite Processing Package (CSPP) LEO

- Supported polar orbiting mission: Suomi NPP and future JPSS-1, also Metop-A/B, NOAA-18/19, Terra, Aqua, GCOM-W1, FY-3B/C
- Funded by NOAA JPSS Program Office since 2010

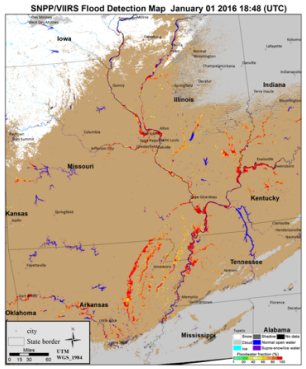
VIIRS EDRs



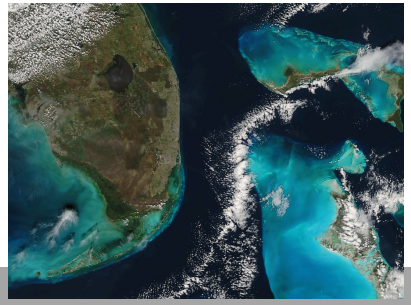
Product Software

- Suomi NPP Sensor Data Records (SDR)
- VIIRS Environmental Data Records (EDR) geophysical products
- HSRTV hyperspectral IR retrievals
- Polar2Grid re-projected imagery
- Hydra interactive data visualization tool
- MIRS microwave sounder retrievals
- CLAVR-x imager retrieval products
- NUCAPS hyperspectral IR and microwave sounder retrievals
- ACSPO sea surface temperature retrievals
- Sounder Quicklooks for atmospheric profiles
- VIIRS Imagery EDR

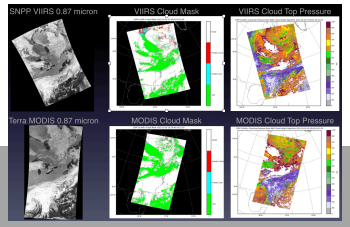
New product:
VIIRS Flood Detection



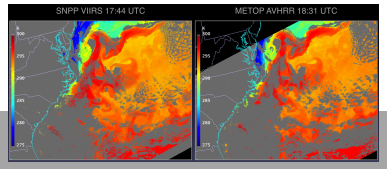
MODIS Imagery (Polar2Grid)



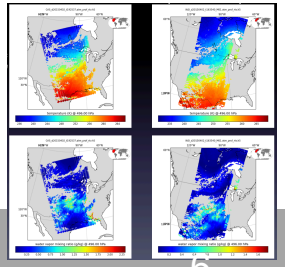
Cloud products (CLAVR-x)



Sea Surface Temperature (ACSPO)



Temperature / Moisture (HSRTV)



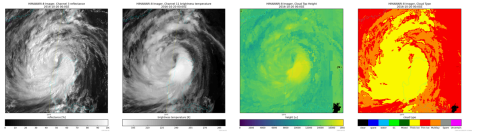
Community Satellite Processing Package for Geostationary (CSPP Geo)

- Supporting Geo satellite missions: GOES-16, also Himawari-8, GOES-13 and 15
- Funded by NOAA GOES-R Program

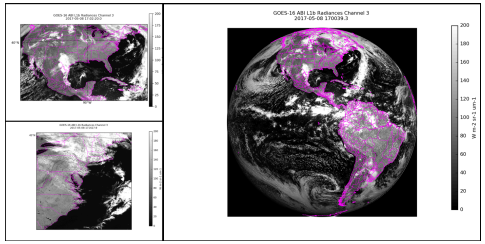
Product Software

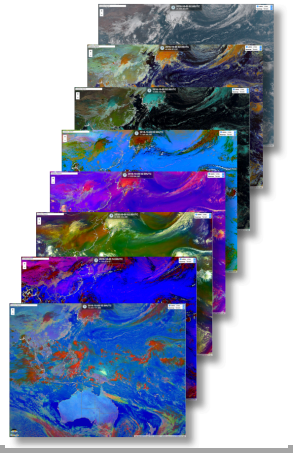
- GRB package (L1 ABI and Space Weather, L2 GLM)
- AIT Framework Level 2 Package for ABI (alpha status)
- GVAR package
- Geocat Level 2 package for Himawari AHI, GOES-13 and 15 (beta status)
- Composite RGB package for Himawari AHI (alpha status)
- Data converters and utilities

Himawari AHI Imagery and Cloud products (GEOCAT)



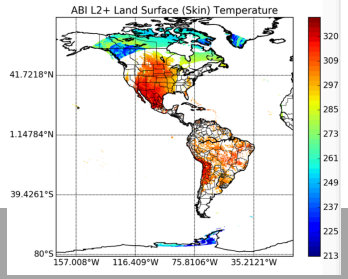
GRB package quicklooks



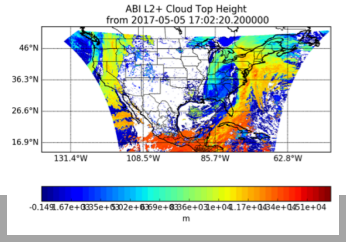


Himawari AHI Composite RGBs

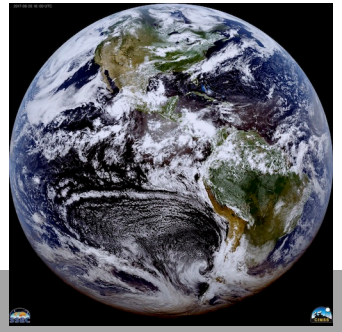
GOES-16 Land Surface Temp. (AIT Framework)



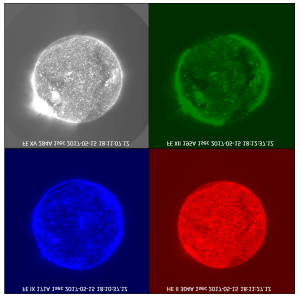
GOES-16 Cloud Top Height (AIT Framework)



GOES-R true color (future package)



SUVI Imagery (GRB Package)



Concerns, opportunities and recommendations

- Keep direct broadcast on future spacecraft
- Keep funding development and distribution of freely available software for direct broadcast users
- Preserve spectrum for direct broadcast
- Consider cost of entry for direct broadcast users
- Add Level 2 products for GOES-16
- DB community should advocate for continued direct broadcast
- Consider DB in all phases of mission (pre- and post-launch)
- Communication with DB users is key (e.g. through groups like GRB Working Group)